PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 58641WO003	**FOR FURTHER ACTION** See Form PCT/IPEA/416	
International application No. PCT/US2004/020953	International filing date *(day/month/year)* 30.06.2004	Priority date *(day/month/year)* 30.06.2003
International Patent Classification (IPC) or national classification and IPC B01J35/04, F01N3/28, F01N3/021, B01D53/88, B01D53/94, D04H1/42, D04H1/46		
Applicant 3M INNOVATIVE PROPERTIES COMPANY et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 9 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 3 sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☒	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
27.04.2005	11.08.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Gosselin, D Telephone No. +49 89 2399-8400

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US2004/020953

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-24	as originally filed

Claims, Numbers

1-20	filed with telefax on 02.08.2005

Drawings, Sheets

1/1	as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US2004/020953

Box No. II Priority

1. ☐ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:
   - ☐ copy of the earlier application whose priority has been claimed (Rule 66.7(a)).
   - ☐ translation of the earlier application whose priority has been claimed (Rule 66.7(b)).
2. ☒ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rule 64.1). Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-20
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. The following documents (D) are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

   D1: EP-A-0 579 956 (CORNING INC) 26 January 1994 (1994-01-26)
   D2: EP-A-0 884 459 (CORNING INC) 16 December 1998 (1998-12-16)
   D3: WO 03/031368 A (3M INNOVATIVE PROPERTIES CO ; HOWORTH GARY F (US)) 17 April 2003 (2003-04-17)
   D4: EP-A-1 314 866 (MINNESOTA MINING & MFG) 28 May 2003 (2003-05-28)
   D5: WO 00/11098 A (MINNESOTA MINING & MFG) 2 March 2000 (2000-03-02)
   D6: EP-A-0 396 331 (CARBORUNDUM CO) 7 November 1990 (1990-11-07)
   D7: US-A-5 028 397 (not cited in the search report)
   D8: EP-A-1 495 807

2. The subject-matter of claims 1 to 20 is supported by the application documents as originally filed (Article 34(2) (b) PCT. More particularly claim 1 is supported by claims 1 and 18 as originally filed. Further restriction are supported by page 5, lines 7-16 (casing exterior exposed to atmosphere) and page 7, line 25 to page 8, line 3 and Figure 1 (respective locations of the pollution control device, the non-intumescent layers, the intumescent layer and the casing according to lines 6-9 of present claim 1).

3. The present application does not meet the requirements of Article 33(1) PCT, because the subject-matter of claims 1 to 20 does not involve an inventive step in the sense of Article 33(3) PCT in view of at least one of the documents D1 to D5 (cf. the passages quoted in the search report).

4. In view of the wording of claim 1, D6 is apparently the closest prior art.

4a. **The terms "with said at least one first non-intumescent layer being disposed between said at least one intumescent layer and said pollution control element, and said at least one second non-intumescent layer being disposed between said at least one intumescent layer and said casing" do not exclude the presence of layers of other materials between the first non-intumescent layer and the pollution control element, between the second non-intumescent layer and the casing, or between each of the non-intumescent layers and the at least one intumescent layer.**

4b. D6 shows that it is common to have at least an intumescent layer comprised between two non-intumescent layers. As it is illustrated in Figure 1 the compression material is comprised of a first layer 26 of non-intumescent material, an intermediate layer 22 of intumescent material and an outer layer 24 of a reinforcing layer which can be i.a. composed of inorganic fiber fabric (non-intumescent material).

The subject-matter of claim 1 differs from the disclosure of D6 in that the respective surface densities of the intumescent and non-intumescent layers are specified.

These features were merely introduced into claim 1 in order to establish novelty over the disclosure of the prior art cited during examination. The applicant failed to provide technical evidence that the presence of the surface densities of the layers, individually or in combination, could be involved in the solution of a technical problem to be defined over the disclosure of D6.

5. Non-intumescent and intumescent layers having the characteristics required in claim 1 of the application are commonly used for mounting pollution control element. The various materials have already been employed for the same purpose in other documents cited in the search report, it would be obvious to the person skilled in the art, to use the different materials with corresponding effect, thus arriving mounting mats according to claims 1 to 19. The prior art documents only fail to explicitly disclosed arrangements according to claim 1 of the application.

5a. The mounting mat according to of claims 1, 2 (polycrystalline ceramic fibres), 7-9, 15 and 16 lacks novelty in view of D1 . There is no evidence in the description that the selection of the features of remaining claims can provide either an unexpected technical effect or solve a different technical problem over a mounting mat according to D1.

The use of a mat according to D1 in a device according to D6 is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill. D4 and D5 also show that the use of multilayered mat in pollution control device is common. The application does not comprise evidence supporting that said combination should provide an unexpected technical effect or solve a specific technical problem in view of D6.

By the way the attention of the applicant is drawn to the fact that, the device of D1 solely differs from the device of claim 1 in that the casing has an exterior exposed to the atmosphere. It could be assumed that once having mounted the mat in said device, the other features of claim 1, in particular "with said at least one first non-intumescent layer being disposed between said at least one intumescent layer and said pollution control element, and said at least one second non-intumescent layer being disposed between said at least one intumescent layer and said casing" will be obtained. There is also no evidence in the application that a device comprising a casing, which has an exterior exposed to the atmosphere, should provide a technical effect or solved a specific technical problem in view of D1.

5b. D2 discloses commonly used mats of both intumescent and non-intumescent materials, which more over present surface densities according to at least claims 3, 4 and 7 to 9 (cf. Example 2). The same applies to D3 (cf. example 6). The mat of US 5 290 522 referred to in D3 is a non-woven mat comprising at least 60 percent by weight shot-free, high strength magnesium aluminosilicate glass fibers. Further materials are disclosed in D4 ([0040]-[0058] (composition of intumescent layer(s)); [0059]-[0070] (composition of intumescent layer(s))), and typical surface densities of

said layers are disclosed in Tables 3, 5 and 7; layer A in Table 3, Example 3 is according to claim 5 of the application. D4 explicitly disclosed that the mat can comprise more than one non-intumescent layer ([0059],[0100]).

The subject-matter of claims 3 to 5 and 7 to 9 would at least not involve an inventive step in view of the combined teaching of D6 and D2, D6 and D3, or D6 and D4. By the way the mat of US 5 290 522 referred to in D3 contains shot-free magnesium aluminosilicate glass fibers, so that the subject-matter of claims 13 and 17 does not involve an inventive step in view of the combination of D1 and D3.

It is at present not possible to identify in the application documents evidence that the features of dependent claims 5, 6, 10, 12, and 14 provide either an unexpected technical effect or solve a different technical problem, the subject-matter of these dependent claims does not involve an inventive step over the disclosure of D6 or D1.

5c. D4 discloses the preparation of multilayer mounting mat for mounting pollution control monolith, the mat providing like in the application high quality mounting system at lowest possible cost. The mat is sufficiently resilient and compressible to accommodate the changing gap between monolith and metal housing over a wide range of temperatures ([0015] and tests).
Even if the examples are directed to mat comprising two layers, the mat of D4 may comprise three or more layers at least one layer of non-intumescent material ([0032],[0059],[0100]). D1 discloses intumescent and non-intumescent materials recited in the dependent claims of the present application ([0022],[0040],[0045],[0061],[0062]). The bulk density of the mat is also disclosed ([0090]). Tables 3, 5 and 7 further referred to intumescent and non-intumescent layers having surface densities according to claims 3 to 5, and 7 to 9 of the application.

The subject-matter of claims 3 to 5, and 7 to 9 of the application does not involve an inventive step over the disclosure of D6 or D1.

5d. It is admitted that D6 (or D1) does not disclosed that the two outer layers ("opposite major sides") of the mounting mat are formed by non-intumescent layers of inorganic fibres. However, such an embodiment is common (D1, D6) and implicitly disclosed, when indicating hat an intumescent layer should be comprised between layers of different compositions (D1: [0100]). The subject-matter of claims 1 to 17 at least does not involve an inventive step in view of D1, since it is at present not possible to identify in the application documents evidence that these features provide either an unexpected technical effect or solve a different technical problem over the disclosure of D6 or D1.

5e. Claims 19 and 20 comprise features, which were not in the claims as originally filed. Their subject-matter were consequently not searched.

However, the provision of mat as needle-punched structure for mounting pollution control element is known in the art (for example D7).

The pollution control element was not described as an essential feature in the application. Such control element are known in the art of exhaust gas catalysis.

The features of claims 19 and 20 are merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill. It is at present not possible to identify in the application documents as originally filed evidence that these features provide either an unexpected technical effect or property, or solve a different technical problem, it is consequently not possible to recognise an inventive step for the subject-matter of these claims.

5f. The features of newly introduced claim 13 were not searched. However, in absence of evidence in the application that said features should provide an unexpected technical effect or solved a specific technical problem, no inventive step can be recognised.

6. The priority claim of the present application is not valid.

6a. The present application claimed a priority based on European application 03 101 941.7 filed on 30.06.2003 published under the number EP-A-1 495 807 (D8). The subject-matter of the present application was modified by introducing:
- in claims 1, and 3 to 9 and in the description, page 1, lines 20-22, page 4, lines 25-27, page 5, lines 14-16, page 7, line 25 to page 10, line 5, features concerning the surface densities of the different layers, and
- in claim 1 the terms "with said at least one first non-intumescent layer being disposed between said at least one intumescent layer and said pollution control element, and said at least one second non-intumescent layer being disposed between said at least one intumescent layer and said casing" or similar arrangements in the description, i.a. page 7, lines 4-7 and page 7, line 25 to page 8, line 3.
It is admitted that same surface density values were disclosed in the examples of the priority documents, however the values were always disclosed for specific materials and specific combinations of layers. Said examples do not support the generalisation introduced by the amendments. The surface densities of the layers was not a concern in the disclosure of the priority document.

6b. D8 does not belong to the state of the art in the sense of Rule 64.1 PCT. This document might be particularly become relevant during the European examination phase when considering the novelty of the subject-matter of the claims referred to in the search report.

AMENDED SHEET

CLAIMS:

1. Pollution control device comprising a pollution control element arranged in a casing with a mounting mat disposed between said casing and said pollution control element, said casing having an exterior exposed to the atmosphere, said mounting mat comprising at least one intumescent layer disposed between at least one first non-intumescent layer and at least one second non-intumescent layer, with said at least one first non-intumescent layer being disposed between said at least one intumescent layer and said pollution control element, and said at least one second non-intumescent layer being disposed between said at least one intumescent layer and said casing,

wherein said at least one intumescent layer comprises an intumescent material and has a surface density of at least about 500 g/m^2, said at least one first non-intumescent layer comprises inorganic fibers, has a surface density of at least about 450 g/m^2 and insulates said at least one intumescent layer from excessive heat from said pollution control element, and said at least one second non-intumescent layer comprises inorganic fibers, has a surface density of at least about 450 g/m^2 and insulates said at least one intumescent layer from relatively lower temperatures of said casing.

2. Pollution control device according to claim 1 wherein at least one of said first non-intumescent layer and said second non-intumescent layer comprises at least one of a layer of glass fibers, a layer of ceramic fibers obtainable from a sol-gel process, and a layer of annealed ceramic fibers.

3. Pollution control device according to claim 1 or 2 wherein the surface density of at least one of said first non-intumescent layer and said second non-intumescent layer is at least about 600 g/m^2.

4. Pollution control device according to claim 1 or 2 wherein the surface density of at least one of said first non-intumescent layer and said second non-intumescent layer is at least about 800 g/m^2.

5. Pollution control device according to claim 1 or 2 wherein the surface density of at least one of said first non-intumescent layer and said second non-intumescent layer is at least about 1000 g/m^2.

6. Pollution control device according to claim 1 or 2 wherein the surface density of at least one of said first non-intumescent layer and said second non-intumescent layer is at least about 1400 g/m^2.

7. Pollution control device according to any one of claims 1 to 6 wherein the surface density of said intumescent layer is at least about 1000 g/m^2.

8. Pollution control device according to any one of claims 1 to 6 wherein the surface density of said intumescent layer is at least about 1500 g/m^2.

9. Pollution control device according to any one of claims 1 to 6 wherein the surface density of said intumescent layer is at least about 2000 g/m^2.

10. Pollution control device according to any one of claims 1 to 9 wherein the uncompressed thickness of said intumescent layer is not more than about 1/3 of the combined uncompressed thicknesses of said first non-intumescent layer and said second non-intumescent layer.

11. Pollution control device according to claim 10 wherein the uncompressed thickness of each of said intumescent layer, said first non-intumescent layer and said second non-intumescent layer is in the range of from about 0.1 mm to about 10 mm.

12. Pollution control device according to claim 10 or 11 wherein the uncompressed thickness of said mounting mat is in the range of from about 3.0 mm to about 30 mm.

13. Pollution control device according to any one of claims 1 to 9 wherein the uncompressed thickness of said intumescent layer is the same or thinner than the

combined uncompressed thickness of said first non-intumescent layer and said second non-intumescent layer.

14. Pollution control device according to claim 1 or 2 wherein at least one of said first non-intumescent layer and said second non-intumescent layer comprises magnesium aluminum silicate glass fibers.

15. Pollution control device according to any of the previous claims having a bulk density of 0.15 to 0.50 g/cm^3.

16. Pollution control device according to any of the previous claims wherein said intumescent layer comprises an intumescent material selected from unexpanded vermiculite, expandable graphite and mixtures thereof.

17. Pollution control device according to any of the previous claims wherein said intumescent layer further comprises inorganic fibers.

18. Pollution control device according to any of the previous claims wherein at least one of said non-intumescent layers comprises inorganic fibers that are essentially shot free.

19. Pollution control device according to any of the previous claims wherein said at least one first non-intumescent layer, said at least one second non-intumescent layer, or said mounting mat comprises a needle-punched structure.

20. Pollution control device according to any of the previous claims wherein the pollution control element comprises a pollution control monolith having a wall thickness of not more than 0.127 mm and from 62 to 186 cells per square centimeter (400 to 1200 cells per square inch).

INTERNATIONAL SEARCH REPORT

ational Application No
/US2004/020953

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01J35/04 F01N3/28 F01N3/021 B01D53/88 B01D53/94
D04H1/42 D04H1/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01J F01N B01D D04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 579 956 A (CORNING INC) 26 January 1994 (1994-01-26) column 5, line 32 - column 7, line 55 column 10, line 3 - line 17 claims 1,3,4,7-9	1-17
Y		3,4,7-9, 18
Y	EP 0 884 459 A (CORNING INC) 16 December 1998 (1998-12-16) page 6, line 53 - line 55 page 7, line 7 - line 10	3,4,7-9
Y	WO 03/031368 A (3M INNOVATIVE PROPERTIES CO ; HOWORTH GARY F (US)) 17 April 2003 (2003-04-17) example 6	3,7-9

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 November 2004	23/11/2004
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Authorized officer Gosselin, D

Form PCT/ISA/210 (second sheet) (January 2004)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 314 866 A (MINNESOTA MINING & MFG) 28 May 2003 (2003-05-28) paragraphs '0021!, '0024!, '0027!, '0029!, '0031!, '0032!, '0040!, '0045! - '0047!, '0051!, '0059! - '0063!, '0071!, '0079!, '0083!, '0090!, '0091!; examples tables 3,7	1-17
Y	WO 00/11098 A (MINNESOTA MINING & MFG) 2 March 2000 (2000-03-02) abstract page 2, line 18 - line 25 page 4, line 30 - page 5, line 1	18
A	EP 0 396 331 A (CARBORUNDUM CO) 7 November 1990 (1990-11-07) column 4, line 34 - line 53 column 6, line 9 - column 7, line 56 claims 1,7-9,13	1-17
A	US 5 028 397 A (MERRY RICHARD P) 2 July 1991 (1991-07-02) column 2, line 15 - line 32 column 2, line 62 - column 4, line 18 table 1 tables	1-17
A	US 3 916 057 A (HATCH ROBERT A ET AL) 28 October 1975 (1975-10-28) claim 1	11

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US2004/020953

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